
Monograph:
Bhaumik, S., Modak Chowdhury, S. orcid.org/0000-0002-8386-9144, Dimova, R. et al. (1 more author) (2023) Identity, communication, and conflict: an experiment. Working Paper. Sheffield Economic Research Paper Series, 2023009 (2023009). Department of Economics, University of Sheffield ISSN 1749-8368

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Sheffield Economic Research Paper Series

SERPS no. 2023009

ISSN 1749-8368

12 April 2023

Identity, Communication, and Conflict: An Experiment*

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March 20, 2023

Abstract

We investigate experimentally the effects of information about native/immigrant identity, and the ability to communicate a self-chosen personal characteristic towards the rival on conflict behavior. In a two-player individual contest with British and Immigrant subjects in the UK we find that neither information about identity nor communicating self-characteristics significantly affect the average level of conflict. Both of those, however, significantly affect players' strategies, in the sense of the extent they involve conflict over time. Overall, the results indicate that inter-personal communication may help to mitigate high intensity conflicts when the identities are common knowledge among rivals.

JEL Classification: C72; C91; D72
Keywords: Conflict; Experiment; Identity; Immigrant; Communication

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* Corresponding Author: Hanna Fromell. University of Sheffield ethics approval (No. 022434) was obtained for this project. The authors gratefully acknowledge financial support for the project from Sheffield University Management School. We thank Francesco Fallucchi, Joo Young Jeon, the participants at the Contests: Theory and Evidence conference, the seminar participants at the University of Groningen for useful comments, and Jose Saporta for research support. We retain the responsibility for any remaining errors.

1. Introduction

Identity, defined as "the distinguishing character or personality of an individual" (Merriam Webster dictionary), significantly influences such individuals' decision making. Studies from psychology and economics reiterate that the salience of an identity that reflects belonging to a particular group or distinction from some other group makes individuals behave differently towards the 'others' (Akerlof and Kranton, 2000, 2010; Chen and Li, 2009; Chen and Chen, 2011). One interesting effect of identity is the way in which it impacts the decision-making process in conflict. Over the course of the century, different dimensions of identity, such as race, language, religion, caste, and nationality have instigated conflict at various levels.

An important dimension of conflict in recent times is the immigration status. Conflict between natives and immigrants observed across the world, including the UK, is often manifested in the form of anti-immigrant sentiments among natives.[1] The reasons for such sentiments can largely be divided into economic aspects and identity aspects. Economic reasons include perceptions that immigrants, via competition over jobs, increase unemployment and reduce wages for natives (Facchini and Mayda, 2009; Espenshade and Hempstead, 1996; Bianchi et al., 2012), perceptions that immigrants are a burden to the welfare state (Hainmueller and Hopkins, 2014; Facchini and Mayda, 2009), and worries over increased crime rates that are ascribed to immigrants (Bianchi et al., 2012). Reasons related to identity primarily concerns the perception that immigrants are not well integrated into their host societies and have norms and moral values that are at odds with those of natives (Schildkraut, 2010). As such, these perceptions, and the (conscious and unconscious) biases associated with them, are often crystallized in the form of differences in ethnicities and religion between individuals and groups (Esteban and Ray, 2008) and often shape opinions about migrants and immigration policy among a section of the British natives (McLaren and Johnson, 2007).[2]

Since conflict is a damaging act both at an individual and at a societal level, a cause of social unrest, and an important reason for hindrance to economic growth (Montalvo and Reynol-Querol, 2005), authorities unsurprisingly aim to reduce conflicts. There are many tools of

[1] According to a Gallup survey, anti-migrant sentiments rose, on average, between 2016 and 2019, with the global Migrant Acceptance Index falling from 5.34 to 5.21. (Source: *World Grows Less Accepting of Migrants*, www.gallup.com, 23 September 2020)

[2] According to an Ipsos Mori survey in March 2022, the proportion of respondents who felt that immigration has had a positive effect is 42%, higher than the proportion of people who felt that immigration has had a negative effect (29%), but 42% of the respondents nevertheless wanted a reduction in immigration levels. (Source: https://www.ipsos.com/sites/default/files/ct/news/documents/2022-03/attitudes-towards-immigration-british-future-ipsos-march-2022.pdf).

conflict resolution that can be implemented in a society, such as mediation (Kimbrough et al., 2014), commitment (Kimbrough et al., 2015), education (Askerov and Askerov, 2010), decentralization (Keil and Anderson, 2018), and communication (Bornstein and Giula, 2003; Amuseghan, 2009). Facilitated communication between conflicting parties is an important mitigation tool for an identity related conflict such as those involving natives and immigrants. For example, using a field experiment in South Africa, Corno et al. (2022) demonstrate that co-habitation and frequent interaction between white and black students increases interracial friendship. Since native and immigrant identities are often linked to their ethno-racial origins, a corollary of this line of research is that communication may help reducing native-immigrant conflict as well. The act of immigration by an individual or a group inevitably assigns them another identity, namely, that of the "immigrant" which may be passed down to their progeny. In this study, we aim to contribute to our knowledge of how native-immigrant conflict can be mitigated by experimentally investigating the effects of structured communication on conflict behavior with and without the presence of immigration related identity.

In theoretical and experimental economics literature, conflict is often modeled as contests, a situation in which the conflicting parties expend costly resources to win a reward. Irrespective of the outcome, as in a conflict in the field, the expended resources are sunk. A popular way of modeling such contests was designed by Tullock (1980) and this model is often employed in the literature (Konrad, 2009). There is also a large literature on contest experiments that investigate conflict and conflict resolution (Dechenaux et al., 2015). The number of studies investigating the interaction of identity and conflict, however, are few.

The idea that 'identity and conflict are inter-related issues' was coined and tested in the Psychology literature from the 1960s (e.g., Sherif et al., 1961; Tajfel and Turner, 1979). In economics, Sen (1984, 2007) posits that the salience of a real social identity (e.g., race, language, religion) often results in a higher level of conflict, while the salience of a classification (e.g., minimal identity in a laboratory) does not do so. In a laboratory experiment, Chowdhury et al. (2016) use race as the real identity and a minimal identity as the classification and find support for Sen's proposition at a group level. Chakravarty et al. (2016) find a similar result in a lab-in-the-field experiment involving Hindus and Muslims in India. See the survey by Chowdhury (2021) for further studies on identity and conflict. However, whereas race, religion, ethnicity etc. are inborn real identity, immigration status or the immigration status of

one's parent are acquired real identity. Hence, it is important to understand whether the standard results related to conflict on inborn identity also holds for such acquired identity.

Moreover, whereas existing experimental studies focus on group conflict, individual conflict with salient identity and ways of conflict resolution in such individual identity driven conflict have not been investigated. Cason et al. (2014) and Leibbrandt et al. (2014) show that free-flow communication among groups can reduce conflict. While Sheremeta and Zhang (2015) report a similar result for individual-level conflict, their results do not investigate the effects of identity. Further, these studies allow free flow of communication in which the contesting subjects in the laboratory can engage in collusion. Hence, it is difficult to tease out reduction in conflict on account of communication from reduction on account of collusion.

We aim to investigate whether structured communication can reduce identity conflict between natives and immigrants. In specific we explore whether identity in terms of immigration status increases conflict. Further, we investigate if minimal communication can reduce such conflict when such identity is salient, and when it is not. In doing so, we run the first experiment that investigates the effects of an acquired identity (immigration status) on conflict behavior. We also are the first to investigate the interaction between identity and communication. This is the first study, therefore, to use highly structured communication in an individual contest setting.

We run a two-player repeated Tullock (1980) contest with four treatments that vary across two dimensions. In one dimension, the subjects either had the knowledge of the immigration status of their opponent or they did not. In another dimension, the immigrants could either choose to send a restricted pre-written message about themselves to their opponent or they had no possibility to communicate at all. The contest is repeated over 20 rounds with random stranger matching protocol. The results from existing literature suggest that an introduction of identity (i.e., knowledge of immigration status) will increase conflict (represented by the bid amounts in the contest game), whereas the introduction of communication will have the opposite effect. However, we find that neither information about identity nor communication significantly affects the average level of conflict aggregated over the 20 rounds.

This no-difference result of immigration identity shows that not all ‘real’ identity has the same effect on conflict behavior. While making race (Chowdhury et al., 2016) or religion (Chakravarty et al., 2016) salient increases conflict, immigration status does not do so. There are laboratory studies (Cox, 2017; Chowdhury et al., 2021) that find no effect of a minimal

identity on conflict level. However, such a minimal identity is distinctly different from race, religion and immigration status since this identity is formed during the experiment. Hence, our results suggest that the non-effect of minimal identity on conflict level may be extended to an acquired identity, and further investigations are warranted.

The no-difference result in communication shows that a strictly restricted communication that does not allow collusion does not result in lowering conflict level on the aggregated level, at least in the laboratory. Unlike the existing studies with free-flow communication (Cason et al., 2014; Leibbrandt et al., 2014), the mode of communication was very restricted in our structure. As a result, the subjects could not collude, and the effects of communication turned out to be very mild. This implies that while a repeated interaction with open communication can improve performance and reduce discrimination or conflict (Corno et al., 2022), a limited restricted communication cannot do so. These results have implications in conflict resolution since limited communication is more likely than free flowing communication between natives and immigrants, as they often are geographically segregated (see, e.g., Eriksson and Ward, 2019). Hence, this study contributes to the literature on contests, identity, as well as immigration.

As we analyze the messages that were sent in the communication treatments, two interesting results stand out. First, we find that conflict behavior correlates with the type of message that a contestant sends to their opponent before engaging in the conflict. One possible implication of this result is that even the most restricted way of communication can influence conflict behavior by enabling the individual to send a message to their opponent. Second, the type of message that subjects choose to send changes over time, where for example sending any message at all becomes more common in later rounds. These two results give reason to investigate conflict behavior over time and how this is affected by our treatments. We do this by comparing bids done in earlier versus later rounds as well as by analyzing the distribution of bids, or "strategies", over the complete set of rounds. We find that, in line with existing evidence, the level of conflict reduces substantially over time. However, over time, if communication is possible, conflict reduces faster when identity is revealed compared to when identity is unknown. This, along with the fact that there is no difference in average conflict level, implies that revealing immigration identity may result in an initial high level of conflict that dies down over time.

Furthermore, we find that letting participants communicate when their immigration status is unknown significantly slows down the reduction in bids over time. We detect no significant

effect of communication on the downward trend in bids when identities are known. This implies that a restricted form of communication, as in our case, can work as a hindrance to reducing conflict without the dimension of identity. This may be because such restricted communication may be perceived only as a noisy signal whose salience cannot be inferred by the engaged parties. As we investigate the distribution of bids across the 20 rounds, three patterns of strategies are common across all four treatments, where subjects either make consistently relatively 'High', 'Moderate' or 'Low' bids, respectively. Our findings are in line with the results from the comparison of bids between earlier and later rounds. Communication increases the likelihood of a subject employing a strategy of High bidding when identities are unknown. Releasing information about identity significantly increases the likelihood of a subject using a High bidding strategy when communication is not possible, but instead may increase the likelihood of using a Low bidding strategy when communication is in place.

Both the result concerning the level of conflict in earlier versus later rounds and the differences in employed strategies are new results to the literature. Especially, the second set of results, namely, that subjects undertake different strategies for different stimuli (identity and communication) contribute both methodologically to the contest experiment literature, and to the literature on conflict resolution. The rest of the paper is organized as follows. We provide a theoretical benchmark in Section 2. Section 3 shows the experimental design and related hypotheses. We report the results on the level of conflict in the next two sections, and further analyze individual level behavior in Section 6. Section 7 concludes.

2. Theoretical benchmark

To set the baseline, we consider a two-player contest with complete information. In this game, 2 identical risk-neutral players each has a budget $E > 0$ that can be used to bid in the contest. Player i ($i = 1, 2$) makes a bid $b_i \in [0, E]$ to win a reward of common value $V > 0$. The reward for the loser is 0. Irrespective of the contest outcome, players forgo their bids, but the leftover budget stays with them. Given the nature of the game, the bids are considered as a measure of conflict intensity. The probability that player i wins the reward, $p_i(b_1, b_2)$, is represented by a Tullock (1980) lottery Contest Success Function:

$$p_i(b_1, b_2) = \begin{cases} b_i/(b_1 + b_2) & \text{if } (b_1 + b_2) \neq 0 \\ 1/2 & \text{otherwise} \end{cases}.$$

Hence, the expected payoff for player i is:

$$E(\pi_i) = p_i V + (E - b_i).$$

One can now follow the standard procedures to solve for the Nash equilibrium of this game. The existence and uniqueness of the equilibrium comes from Szidarovszky and Okuguchi (1997) and Chowdhury and Sheremeta (2011). The unique symmetric interior Nash equilibrium bid is: $b^* = V/4$ and the expected equilibrium payoff is: $\pi^* = E + V/4$.

Note that the equilibrium bid does not depend on the identity of the rival individual. Hence, as long as the interior equilibrium exists, the standard model predicts that the equilibrium bid is unchanged for any pair of competing players. We ensure in the experimental design described below that the available budget is large enough ($E \geq b^*$) to obtain an interior solution. Furthermore, the equilibrium remains the same for finite repetition of this same game.

Alternatively, one's own and the opponent's identity can affect the utility of the players and a social preference model of contest can be implemented to capture such effect (Herrman and Orzen, 2008; Chowdhury, 2021). A simple linear version of the same is given below:

$$u_i = \pi_i + f_i(\pi_i, \pi_j | \pi_i \geq \pi_j) + g_i(\pi_i, \pi_j | \pi_i < \pi_j)$$

where u_i is the utility of player i, and f_i and g_i are functions that depict their utility while comparing their own payoff with that of their opponent's. If the player gains more (less) utility when they earn more (less) payoff than the opponent while having different identities, then the equilibrium bid ($> V/4$) will be higher than a standard contest (Mago et al., 2016).

There may be other behavioral factors that have to be considered while incorporating identity in this set-up. Specifically, when we consider the native-immigrant identity and related information revelation, then individual heterogeneity can affect not only the average bid level or the messages sent, but also how they react to the opponent. We discuss these further in the hypotheses section and investigate such behavioral aspects in Section 6.

3. Experimental Design and Hypotheses

3.1. Experimental Design

We ran the two-player Tullock contest experiment outlined above with four treatments. In each treatment the subjects participated in the contest for 20 rounds. In every round, each subject was given an endowment of 200 pence that they could expend (make bid) to win a prize of 200 pence. Hence, following the theory, we had $E = V = 200$, and $b^* = 50$.

The experiment was run in the UK and in each treatment, there were subjects with two types of immigration status – natives (British) and immigrants (non-British). As a result, there were three possible pair combinations: Immigrant-Immigrant, Native-Native, and Native-Immigrant. In a 2×2 factorial design the treatments varied with whether or not any demographic information about the opponent is available, and whether or not a message can be sent to the opponent (prior to making a bid). This is summarized in Table 1 below.

Table 1. Treatment table

	No Communication	Communication
No Demographic-attributes	**ND-NC**	**ND-C**
Demographic-attributes	**D-NC**	**D-C**

In the Baseline case (ND-NC), no demographic attribute of any subject was revealed, and no communication among them was possible. In ND-C, no demographic attribute was revealed, but the subjects could communicate with the opponent by sending a message, if they wanted. By contrast, under D-NC no communication was possible, but the subjects could observe some demographic attributes of the opponent. Finally, in the D-C treatment demographic information was available and communication was possible.

In the Demographic-attributes treatments, subjects could observe information about three attributes of the opponent: 'immigration status', 'age', and the 'season of birth'. Although we are interested in the effects of the immigration status, we also included two further 'placebo' information as in Gangadharan et al. (2019) to avoid any possible experimental demand effect (Zizzo, 2010) of providing only the immigration status information. We ran placebo tests on these other two attributes and found no effect of such information on subject behavior at the traditional significance levels. Hence, we do not discuss these treatments later in the paper.

In the communication treatments, subjects had the option to send one of three pre-specified messages or to not send any message. The three messages were positive self-descriptive statements that we categorize under the heads "Social" (family / friends), "Constructive" (positive / thoughtful), and "Fair" (respect / equality). To further increase the sense of choice and meaning carried by a message we included two sets of messages, whereby each of the three message categories were represented in each of the two sets. The two sets of messages were randomly allocated between subjects, while ensuring that an equal share of both sets was

assigned within each type (native or immigrant) and session. The messages in one set were (i) "I am a person who values family", (ii) "I am a person who has a positive mind", and (iii) "I am a person who is respectful to everyone"; whereas those in the other set were (i) "I am a person who values friendship", (ii) "I am a person who is thoughtful", and (iii) "I am a person who treats everyone equal". Prior to running the experiment, we verified that for each message category the messages in the two sets were perceived to be similar. A different set of students of similar background to the subject pool were asked to categorize those as either 'social' or 'constructive' or 'fair', and their categorization matched with ours. Further, they ranked the messages in terms of being 'cooperative', 'inclusive', 'empathetic', 'likeable', and 'selfish'. There was no significant difference between the two sets for any of the three message categories in terms of these features.

The aim of including such restrictive messages was to create a sense of communication that reduces psychological distance (Liberman, et al., 2007) between the two participants. However, the communication was not open, because we did not want to allow for any information dissemination about one's intended strategy which could result in collusion (as observed in the market experiments on cartels, or in group contest experiments).

The experiment was conducted at the University of Nottingham by a research assistant unaware of the aim of the experiment. Only one session with 40 subjects was run per treatment and subjects could participate in only one session. Subjects were the students at the university recruited through ORSEE (Greiner, 2015) and with no prior experience with either identity or contest experiment. "Natives" were identified based on reported nationality as "UK" in ORSEE. However, Natives with non-British sounding names were not invited since those can either be due to reporting error, or due to immigrant heritage. All non-UK nationalities were invited to constitute as "Immigrants". Furthermore, questions controlling for nationality were added to a post-experiment questionnaire for further identification of identity: country of birth, number of years spent in the UK, nationality. In each treatment, exactly 50% of subjects were pre-registered in the subject pool database as having a British nationality. We also used subjects' answers to whether they are British nationals as self-reported at the beginning of the experiment, which in a few cases, differ from that of their pre-registered data. Table 2 provides the summary statistics of the subject demographics. The differences in each of the demographic sections between any two treatments are not statistically significant.

Table 2. Summary statistics: demographic conditions

	ND-NC	ND-C	D-NC	D-C
Female	0.525	0.577	0.423	0.600
	(0.503)	(0.497)	(0.497)	(0.493)
Age	19.763	20.115	20.436	20.450
	(2.058)	(2.335)	(2.036)	(2.092)
Immigration status: Native	0.500	0.513	0.474	0.500
	(0.503)	(0.503)	(0.503)	(0.503)
N	80	78	78	80

For the treatments in which communication was possible, the subjects were given the three above mentioned options and an option of 'no message' that they could send to the opponent prior to making their bid, in each of the 20 rounds. In the treatments in which demographic information was available, that information was provided at the start of every round. The matching protocol employed was random stranger, in which each subject was randomly matched with another subject in every round. We employed such a matching protocol because tacit collusion may arise in two-player experimental contests with a partner matching protocol (Baik et al., 2022). Stranger matching avoids any multiplying effect on tacit collusion when communication is possible. However, in the first round of each treatment, a quarter of the subjects were matched as Native-Native, another quarter as Immigrant-Immigrant, and the remaining as Native-Immigrant.

The experiment was coded in z-tree (Fischbacher, 2007). After every round the subjects were informed about their own bid, the total bid, whether she has won, and their payoffs in that round. After the experiment was concluded, 5 out of the 20 rounds were selected at random and were used for calculation of final experimental earnings. Each session took about 1 hour and 25 minutes, and subjects earned on average £11.13 (min £4.20 and max £16.95).

3.2. Hypotheses

In this section we state the behavioral hypotheses related to the bid level and the treatments, bid level and messages. Note that the standard Nash equilibrium predicts that the observed bids across the treatments are the same. However, we provide the main alternative hypotheses coming out of the experimental design.

First, given the notion of Sen (2007) and Chowdhury et al. (2016) and as indicated in the theory section, we state that if the immigrant identity is salient enough, then this should increase the conflict. This translates into our first hypothesis.

Hypothesis 1. Observed bid level in the 'Demographic-attributes' treatments are higher than the observed bid level in the 'No Demographic-attributes' treatments.

Note that the Demographic-attributes treatments include pairs from both same identity (Native-Native, Immigrant-Immigrant) and different identities (Native-Immigrant). The experimental results in the literature so far considered only different identities. Hence, it may be possible that the conflict level depends on the match. In specific, homophily norms may result in lower bids in same identity match. The corresponding hypotheses are given below.

Hypothesis 2. In the Demographic-attributes treatments bid levels are higher for different identity matches than those in the No Demographic-attributes treatments, which are higher than the bid levels for the same identity matches in the Demographic-attributes treatments.

Next, we focus on the effects of communication on conflict level. It is shown that a free-flow communication reduces conflict (Cason et al., 2014; Leibbrandt et al., 2014). If the observed reduction in conflict is on account of the communication itself, and not on account of the collusion that is possible in a context with free-flowing communication, then structured communication should also reduce conflict. This is our next hypothesis.

Hypothesis 3. Observed bid level in the 'Communication' treatments are lower than the observed bid level in the comparable 'No Communication' treatments.

In practical terms, there may be further behavioral factors that play a role while incorporating identity in this set up. This can be reflected in the messages sent and received. A behavioral hypothesis would, therefore, be that the type of messages sent and received affect the bid level.

Hypothesis 4. Observed bid level in the 'Communication' treatments are associated differently with the different types of messages a subject sent, as well as the type of message received.

4. Results on bid level

Since we have employed a stranger matching protocol, each session provides an independent observation. Below we first report the descriptive statistics, and then undertake panel

regression analysis with the bid level as our variable of interest. Finally, we analyze the messages and find the relationship between sent and received messages and bids.

4.1. Descriptive statistics

Table 3 reports the average bids across all 20 rounds for the entire sample, separately by the four treatments, as well as by gender and immigration status match. As we can observe, the reported averages do not differ by treatment, gender and immigration status match.

Table 3. Average bids by treatment, gender, and immigration-status match

	All	Men	Women	Native-Native	Native-Immigrant	Immigrant-Native	Immigrant-Immigrant
ND-NC	78.753	68.555	87.979	74.292	75.243	84.641	82.033
	(38.655)	(37.216)	(38.021)	(34.887)	(36.403)	(44.098)	(41.393)
ND-C	81.139	70.241	89.131	85.702	86.854	77.054	74.693
	(37.997)	(43.496)	(31.564)	(41.904)	(40.172)	(35.253)	(38.758)
D-NC	76.688	67.854	88.733	70.669	71.009	82.882	81.669
	(41.311)	(39.413)	(41.367)	(39.95)	(37.316)	(44.969)	(45.506)
D-C	82.011	73.056	87.980	81.167	83.660	81.239	82.783
	(36.661)	(34.029)	(37.474)	(34.654)	(40.036)	(38.192)	(38.952)
N (subjects)	316	148	168	157	157	159	159

Note: Standard deviations in parentheses. Standard deviations (and mean values) are calculated by first computing the average bid for each subject across all relevant rounds and thereafter computing the average of this average across all subjects. The first three columns present average bid levels of all 20 bids made by all subjects, all men, and all women respectively, in each of the four treatments. In the fourth and fifth column, the presented values are from the bids made by all Natives (i.e., 157) in the subset of rounds where they were matched with a Native (column 4) and an Immigrant (column 5) respectively. In the sixth and last column, the presented values are from the bids made by all Immigrants (i.e., 159) in the subset of rounds where they were matched with a Native (column 6) and an Immigrant (column 7) respectively.

Since each session is an independent observation, the only way to statistically test whether the bids over the 20 rounds are different across treatments would be through a panel regression. However, the observations in the very first round remain independent and therefore are suitable for non-parametric tests. With 158 such independent observations per treatment-dimension, we had the power to detect an effect size equal to 0.32 or higher for our two hypotheses regarding the two treatment variations (i.e., H1 and H2), assuming an alpha of 0.05 and power of 0.8. A Kruskal-Wallis test and pairwise Mann-Whitney tests show no significant differences in first-round average bids across treatments (p values >0.05), and Hypotheses 1, 2, and 3 are rejected for the first-round observations.

4.2. Regression analyses on bid level

We estimate random effect panel regressions while clustering the standard errors at the subject level. The dependent variable is the individual bid in a particular round. The independent variables of interest are the demographic treatment dummy, and the communication treatment dummy. As is common in the literature, we control for age, gender, lag of bids and win, and time trend. While we have 6320 bids in total (80+80+78+78 = 316 subjects, with 20 bids each), the lagged control variables of own bid, other's bid and win removes all round-one bids.

Table 4. Impact of treatments on bid level

Dependent variable: **Bid amount**	(1) All	(2) All	(3) ND-NC & D-NC	(4) ND-C & D-C	(5) ND-NC & ND-C	(6) D-NC & D-C
D-	-0.069		0.374	-0.484		
	(1.432)		(2.005)	(2.060)		
-C		0.234			0.600	-0.186
		(1.415)			(2.019)	(2.008)
Age	0.362	0.358	0.624	0.091	0.748	-0.092
	(0.398)	(0.391)	(0.685)	(0.418)	(0.617)	(0.443)
Female	6.208***	6.186***	6.906***	5.396**	6.682***	5.702***
	(1.474)	(1.481)	(1.984)	(2.236)	(2.202)	(1.998)
Round	-0.487***	-0.487***	-0.543***	-0.430***	-0.488***	-0.488***
	(0.068)	(0.068)	(0.099)	(0.096)	(0.090)	(0.104)
L. own bid	0.691***	0.690***	0.720***	0.656***	0.685***	0.694***
	(0.026)	(0.026)	(0.036)	(0.037)	(0.032)	(0.040)
L. other bid	0.069***	0.069***	0.048***	0.093***	0.076***	0.062***
	(0.011)	(0.011)	(0.015)	(0.015)	(0.016)	(0.015)
L. win	-2.212**	-2.212**	-3.395**	-1.327	-1.167	-3.195**
	(1.005)	(1.005)	(1.395)	(1.456)	(1.506)	(1.354)
Constant	14.459*	14.410	8.926	20.509**	5.639	24.808**
	(8.355)	(8.318)	(13.534)	(9.217)	(12.287)	(10.545)
N (observations)	6,004	6,004	3,002	3,002	3,002	3,002
N (subjects)	316	316	158	158	158	158

Note: Robust standard errors clustered at the subject level in parentheses. All models are run with random effects at the subject level. *** p<0.01, ** p<0.05, * p<0.1.

The results are presented in Table 4 and show no significant effects of either demographic information or communication. The first two columns formally reject our first and second hypotheses, which regard the treatment effects at the aggregate level. Columns 3-6 further confirm the absence of any treatment effect in each of the treatment conditions separately. As observed in the literature, females bid more in all the treatments. Lagged own and opponent bids are positively related to current bids, and bids decrease over time. These results remain similar in terms of sign and significance threshold of coefficients if we include a dummy variable that interacts female with the relevant treatment. However, the introduction of this

interaction term changes the significance level for the female dummy variable from 5% (p=0.015) to 10% (p=0.087), in column (4). In column (6), it has an impact on the coefficient for communication treatment, which becomes negative but remains insignificant, and on the coefficient of the female dummy which changes significant level from 5% (p=0.004) to 10% (p=0.028). The interaction term itself remains insignificant in all four models (columns 3-6).

We next examine the role of the pairing of subjects according to their immigration status on bid levels. The non-parametric tests following Table 3 show no differences in average bid levels between subjects with different immigration status or depending on the immigration status of their matched subject in any of the treatments. Regression results in Table 5 similarly show that there is no difference in bids among subjects in the D treatments when their identity is the same as their opponent compared to bids among subjects in the ND treatments. Nor is there a difference between bids of subjects in the D treatments when their identities are different from their opponent compared to bids in the ND treatments. These results hold also if we perform the same test for each of the two Communication conditions separately.

None of these tests show any evidence that introducing the demographics makes a difference for these subgroups. Including an interaction term between female and the relevant treatment does not alter results, nor does running the same tests on (sub-)samples of only natives or only immigrants. The significance and signs of the coefficients of the control variables are consistent with the results in existing literature. In summary, these regression results, along with the non-parametric tests from Section 4.1, reject hypotheses 1, 2, and 3.

Table 5. Impact of demographics on bid levels by nationality match

Dependent variable:	Bid amount
D-*homogenous	-0.010
	(1.576)
D-*heterogeneous	-0.123
	(1.552)
Age	0.362
	(0.398)
Female	6.209***
	(1.474)
Round	-0.487***
	(0.068)
L. own bid	0.691***
	(0.026)
L. other bid	0.069***
	(0.011)
L. win	-2.214

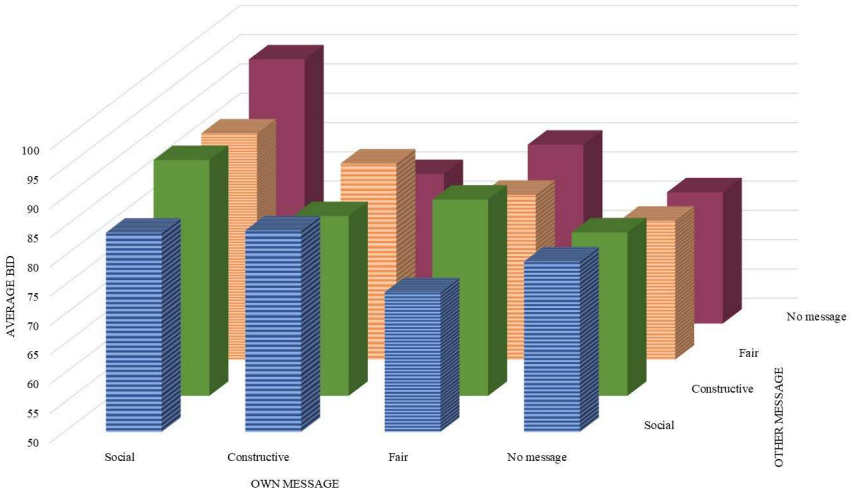
	(1.002)
Constant	14.465
	(8.356)
N (observations)	6,004
N (subjects)	316

Note: Robust standard errors clustered at the subject level in parentheses. The model is run with random effects at the subject level. *** p<0.01, ** p<0.05, * p<0.1. The reference group to the interaction terms D-*homogenous and D-*heterogeneous is all bids in the ND treatments

5. Analysis of the messages

This section investigates how the messages may have affected the bids made by subjects in the ND-C and D-C treatments. Recall that messages fall into either one of three message categories: "Social", "Constructive" or "Fair". Figure 1 reports average bids by the type of message sent by the bidder and their partner respectively. It appears that bids made by subjects vary depending on the type of message they send to their opponent, "own message", but that they vary less with the type of message they receive from their opponent, "other message". This overall pattern appears to hold when we look separately at women and men, as well as for heterogeneously and homogenously matched subjects.

Figure 1. Average bids by own message and partner's message



This pattern could arise if certain subjects are at once prone to sending certain types of messages and make systematically lower (or higher) bids. This would then suggest the existence of different types of bidders where subjects with, possibly, certain characteristics and preferences bid differently from others. The pattern could, however, also arise from subjects adjusting their bids with the type of message they send. As we demonstrate below, we find evidence for both sources of variation.

Since we have already rejected hypotheses 1-3, we start by investigating the possibility that the correlation between messages and bid levels stems from within-subject variation (as opposed to across subject-variation). We do so by including a dummy variable for sending a particular message into the random-effects regression on the entire panel data set (of ND-C and D-C bids). The results are presented in Columns (1) - (3) of Table 6. "Own message *Social"* is a dummy that equals one if the subject sends the message pertaining to the category family and friends in a given round, "Own message *Constructive"* is a dummy for sending the message pertaining to the category positive and thoughtful, and "Own message *Fair"* regards to the category respectful and equal. We find a positive within-subject correlation between the variable Own message *Social* and bid level, suggesting that subjects adjust their bid levels according to the message they send (or vice versa). We also ran a similar analysis on the messages received, but none of the categories turn out to be significant. Hence, we do not report those results in detail, but they are available from the authors upon request.

Table 6. Impact of own messages on bids

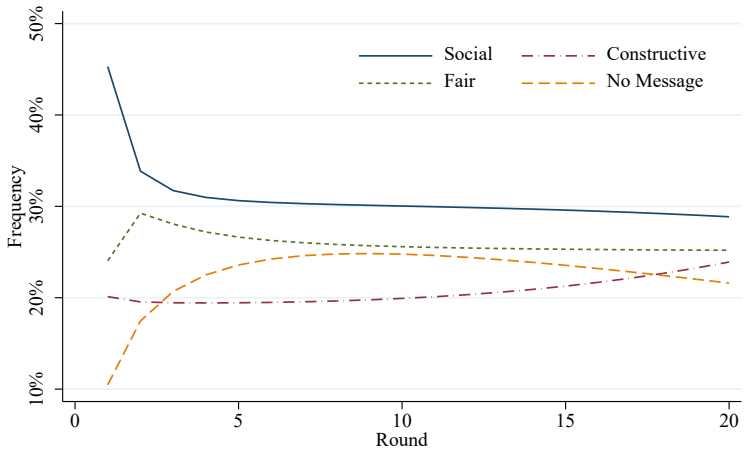
Dependent variable: Bid amount	(1)	(2)	(3)	(4)	(5)	(6)
			ND-C & D-C			
Own message *Social*	5.417***					
	(2.046)					
Own message *Constructive*		-2.221				
		(2.135)				
Own message *Fair*			-2.377			
			(2.099)			
No. own message *Social*				1.003**		
				(0.500)		
No. own message *Constructive*					0.026	
					(0.529)	
No. own message *Fair*						-0.532
						(0.531)
Age	0.119	0.109	0.089	-0.003	-0.158	-0.116
	(0.411)	(0.417)	(0.416)	(1.101)	(1.124)	(1.123)
Female	5.744***	5.551**	5.343**	17.857***	16.914***	16.671***
	(2.207)	(2.232)	(2.242)	(5.946)	(6.078)	(6.069)
Round	-0.425***	-0.425***	-0.433***			
	(0.096)	(0.097)	(0.096)			
L. own bid	0.652***	0.656***	0.656***			
	(0.036)	(0.037)	(0.036)			
L. other bid	0.093***	0.093***	0.094***			
	(0.015)	(0.015)	(0.015)			
L. win	-1.416	-1.228	-1.403			
	(1.457)	(1.469)	(1.457)			
Constant	18.296**	20.176**	21.058**	16.931***	74.713***	76.872***
	(9.230)	(9.173)	(9.115)	(22.725)	(22.431)	(22.305)
N (observations)	3,002	3,002	3,002	158	158	158
N (subjects)	158	158	158	158	158	158

Note: Models in column (1) – (3) are run with robust standard errors clustered at the subject level (in parentheses) and with random effects at the subject level. Models in column (4) – (6) are run with robust standard errors (in parentheses). *** p<0.01, ** p<0.05, * p<0.1.

We next investigate the between-subject correlation between messages and bid levels by including a variable that represent, for each subject, the number of times a given message was sent over the 20 rounds. These results are reported in column (4) – (6) in Table 6. Column (4) shows that, on average, subjects who send the message pertaining to the message category social make significantly higher bids. That is not the case for the other two categories.

We further study the differences in messages graphically. Figure 2 shows the frequency that each message is sent across the 20 rounds. There is clear variation in the usage of the various messages, but this difference abates as the rounds proceed. The most distinctive feature is that the frequency of the messages pertaining to the category Social is very common to begin with but is sharply reduced within the first few rounds. By contrast, the frequency of not sending any message is very low in the initial rounds but increases markedly in use thereafter.

Figure 2. Frequency of messages over rounds



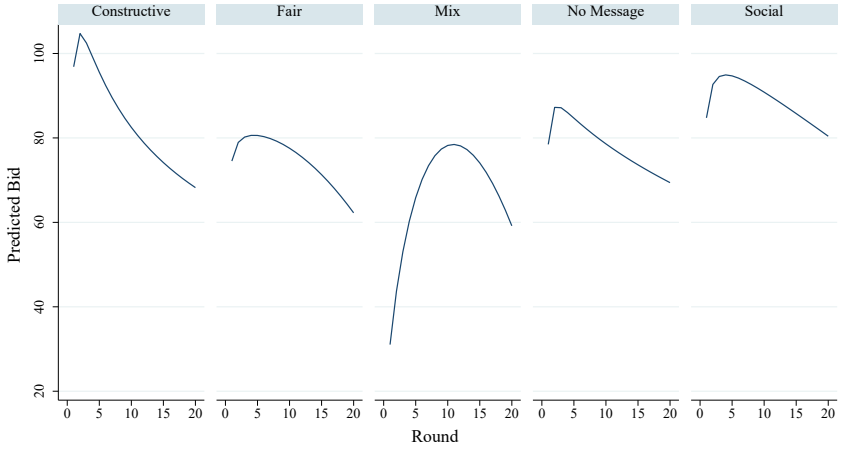
Note: Fractional-polynomial prediction plot.

We proceed by further investigating the between-subject relationship identified in Table 6 by plotting the average bids for subgroups of subjects categorized according to their message sending behavior. Figure 3 presents fractional-polynomial prediction plots of the bid distribution, splitting the sample according to the most frequent message sent. Subjects whose most frequent message pertains to the category Constructive show a stronger negative slope in their bids over rounds compared to other subjects.

The regression and the graphs show that we cannot reject hypothesis 4. Whereas the messages received by the opponent do not affect bidding behavior, own message sent is correlated to both the bid level, and the pattern over periods. Similar phenomenon has been observed for the public good game (Giardini et al., 2021). This, therefore, raises the question whether this

heterogeneity in behavior results in within subject effects. We investigate it in the next section.

Figure 3. Average bids by most frequent message sent



Note: Fractional-polynomial prediction plot.

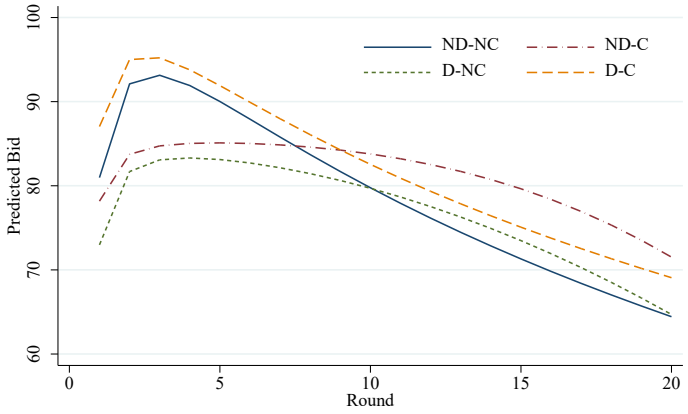
6. Individual level analyses

The analyses in the previous section highlight individual-specific differences in decision making and pattern over time. As shown in the literature, individual level heterogeneity can affect bid pattern (Sheremeta, 2013). In the specific context of our setting, if a player has some initial expectation about an opponent-identity, and updates such expectations after interactions, they may choose to decrease, hold constant, or increase their bids with experience. This initial expectation may also depend on whether communication with the opponent is possible. Hence, those aspects relating to individual differences and differences over time/rounds can affect the simple treatment effects. But, to the best of our knowledge, there is no existing study that explores such heterogeneity in terms of either communication or identity and its effect on conflict behavior.

6.1. Difference in behavior over time

The frequency of the use of different messages varies across rounds and, as we have already noted, the subjects' use of specific messages can correlate with their bid levels. This suggests that subjects behave differently over rounds and that this may have important implications for their bids. Specifically, it is possible that any impact of our treatments differs for earlier and later rounds. It is clear from the literature and from the analysis above that subjects gradually reduce their bids across rounds and this is shown graphically for each treatment separately in Figure 4. The slope of the predicted values, starting from about round 3, however appear to be much steeper in ND-NC and D-C.

Figure 4. Bid distribution by treatment



Note: Fractional-polynomial prediction plot.

To be able to proceed with an analysis of the development of bids over time, we follow Abbink et al. (2010) and investigate differences in bids made in the first 10 rounds ("first half") with bids made in the last 10 rounds ("second half"). We then test for a difference in the bid levels over time by running a difference-in-differences pooled OLS on bid levels with robust clustered standard errors at the subject level (presented in Table 7). Specifically, we regress bid level on a dummy variable "Second Half" that equals 1 if the bid was made in the second half of the rounds, the treatment dummy, an interaction term between the two dummy variables as well as our standard controls. Using this difference-in-differences approach allows us to investigate the existence of a treatment effect on learning, in the form of gradually lowering one's bids, while allowing for any additional treatment effect that may still occur already in the first rounds. We find that while bids are lower in the second half compared to the first half in all treatments, this decline is greater in the D-C treatment (p=0.060) compared to the ND-C treatment. This implies that the subjects reduce their bids to a greater extent when demographics are shared. With regards to the impact of communication, we find that the decline in bids in later rounds is substantially attenuated when demographics are not shared: the difference in average bids between the second half and the first half is much smaller in the ND-C treatment compared to the ND-NC treatment (p = 0.024). There is instead no significant difference in this second-round effect between the D-C and D-NC treatments, indicating little or no effect from introducing communication when identities are known.

Table 7. Second half vs first half bid levels

Dependent variable: Bid amount	(1) ND-NC & D-NC	(2) ND-C & D-C	(3) ND-NC & ND-C	(4) D-NC & D-C
Second Half	-17.427***	-5.868*	-17.428***	-9.906***

	(3.886)	(3.129)	(3.886)	(3.565)
D-	-4.998	4.693		
	(7.060)	(6.078)		
Second Half * D-	7.521	-8.318*		
	(5.273)	(4.355)		
-C			-5.005	4.293
			(6.450)	(6.558)
Second Half * -C			11.560**	-4.280
			(4.989)	(4.678)
Age	1.766	-0.160	1.838	-0.540
	(2.088)	(1.121)	(1.765)	(1.290)
Female	19.790***	16.942***	18.560***	17.960***
	(6.207)	(6.031)	(6.176)	(6.099)
Constant	42.168	77.527***	41.399	85.077***
	(40.565)	(22.395)	(33.547)	(27.354)
N (observations)	3,160	3,160	3,160	3,160
R2	0.058	0.038	0.055	0.046

Note: Robust standard errors clustered at the subject level in parentheses. All models are run with random effects at the subject level. *** p<0.01, ** p<0.05, * p<0.1.

The difference-in-difference analysis in Columns 1 and 2 imply that disclosure of the demographics initially had little or no effect on bids. At the same time, learning, which takes place in both treatments in terms of reduced bids in later rounds, is faster when demographics are revealed. This faster learning from revealing demographics, however, only happens in the communication treatments (Column 2). When demographics remain unknown (Column 3), the introduction of communication slows down the 'learning' process of lower bidding. This, together with the impression from Figure 3, imply that communication can work as a hindrance to reducing conflict when parties have little knowledge about one another's identities.

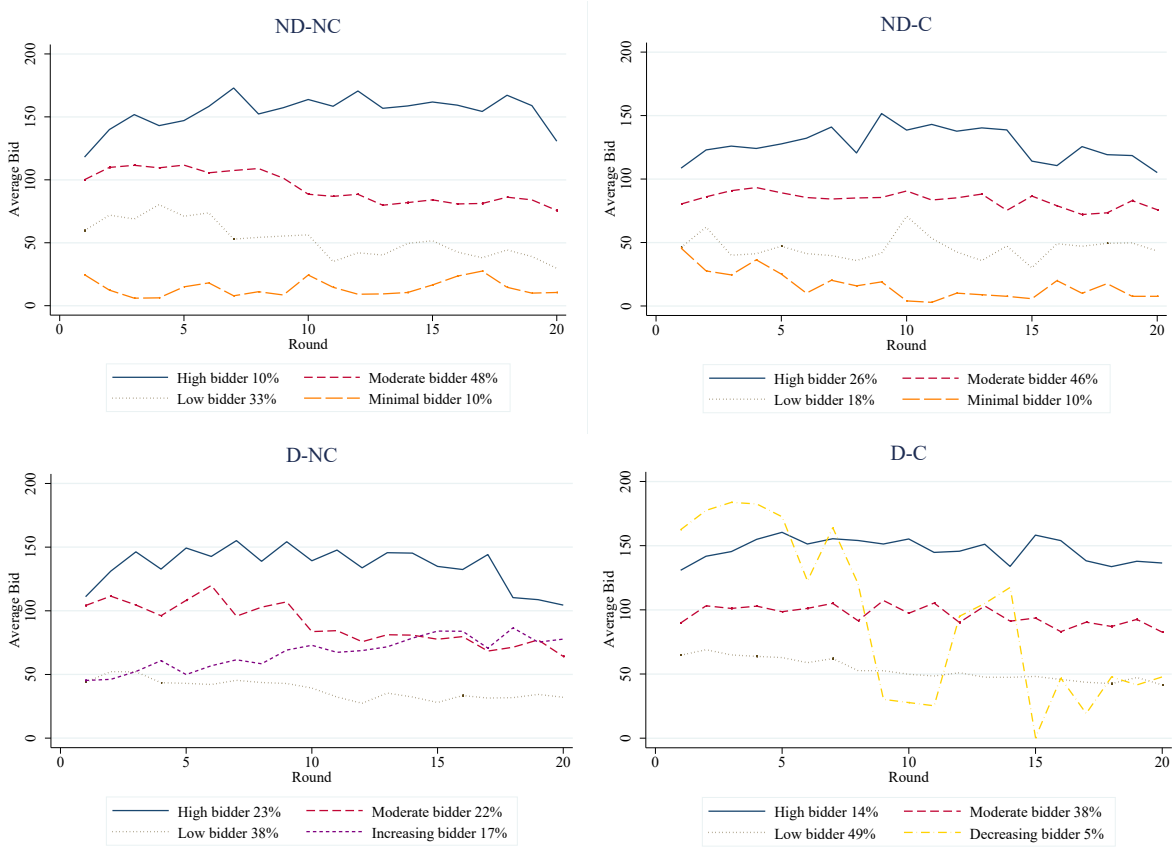
6.2. Difference in distribution of bids or "bidding strategies"

Based on the difference-in-difference analysis reported in section 6.1, we can make two distinct observations. First, as we have already noted, there are clear differences across treatments in how bid levels differ in later and earlier rounds. Second, standard errors in bid levels are considerably high in both the later and earlier rounds. This heterogeneity in bids, both over time and between subjects suggest that subjects may be undertaking very different strategies in how they adjust their bids over the 20 rounds (Figure 4), and possibly, that the treatments may influence such strategies (Table 7). We investigate this possibility by following Su et al. (2016) and Fallucchi et al. (2021) in employing hierarchical cluster analysis to identify different bidding strategies. This method is entirely data driven and identifies strategies (or "clusters") in the data over the 20 rounds in order to categorize subjects into homogenous groups who use the same strategy. Strategies are selected in a process that minimizes the difference between

the bids of subjects belonging to the same group and maximizes the difference across groups. We undertake this analysis for each treatment separately.

Figure 5 presents the resulting strategies in each treatment. After browsing the results, we label the strategies as 'High', 'Moderate', 'Low', 'Minimal', 'Increasing' and 'Decreasing'. We now proceed by comparing the share of subjects that are categorized into each of these strategies in the different treatments and find results that are largely in line with those of the previous sub-section. Comparing the bottom-left graph with the top-left graph we find further indication that demographic information reduces bids when it is not accompanied by communication. We make two specific observations: first, the share of High-bid strategies increases from 10% to 23%. Second, the group of people who engage in Minimal bidding disappears and instead a group that gradually increase their bids come into existence. On the other hand, in the presence of communication, the share of High bids is lower in D-C compared to ND-C (14% vs 26%).

Figure 5. Bid distributions by bidding strategy and treatment



Note: Average bid by cluster, produced for each treatment separately.

Consider now both graphs in the upper panel. We observe that for the ND-C treatment, the share of High-bid strategies is more than double the corresponding share in the ND-NC treatment. When we consider instead the graphs in the bottom panel, when each subject has

demographic information about the other, the share of High bids dropped from 23% in D-NC to 14% in D-C. Furthermore, introducing communication introduces a different strategy where bidders gradually lower their bids in subsequent rounds, as opposed to ND-C in which 17% of the bidders gradually increase their bids.

We next formally test these differences using Logit regressions whose estimates are reported in Tables 8 and 9. They estimate the probability of being assigned to a given bidding strategy compared to other bidding strategies. Since only three bidding strategies – High, Moderate and Low – are common in all four treatments, we include the results for only these three strategies. Table 8 presents results of the impact of sharing identity under communication and under no communication. We find that subjects in the D-NC treatment are significantly more likely to be classified into the High-bid strategy as well as into a Moderate-bid strategy compared to subjects in the ND-NC treatment. Instead, (in line with the results in Section 5) subjects are significantly less likely to be classified as adopting a High or Moderate strategy and more likely to adopt a Low-bid strategy in the D-C treatment compared to ND-C.

Table 8. Impact of demographics on bidding strategy

Sample:	ND-NC & D-NC			ND-C & D-C		
Dependent variable:	High	Moderate	Low	High	Moderate	Low
D-	1.103**	-1.135***	0.194	-0.746*	-0.617*	1.53***
	(0.482)	(0.358)	(0.343)	(0.417)	(0.337)	(0.374)
Age	0.053	-0.023	0.014	-0.136	0.068	0.003
	(0.134)	(0.098)	(0.085)	(0.116)	(0.072)	(0.071)
Female	1.027**	0.353	-0.612*	0.540	0.395	-0.723**
	(0.450)	(0.353)	(0.342)	(0.450)	(0.342)	(0.367)
Constant	-3.896	0.167	-0.705	1.317	-1.751	-1.207
	(2.582)	(1.944)	(1.699)	(2.228)	(1.473)	(1.506)
N (observations & subjects)	158	158	158	158	158	158
Pseudo R2	0.074	0.063	0.019	0.043	0.026	0.106

Note: Logit regression coefficients with robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9 reports how communication affects the likelihood of being categorized into either strategy. The first three columns show that subjects are more likely to be classified as using a High-bid strategy and less likely to be classified as using a Low-bid strategy in ND-C compared to ND-NC. This is just confirming the conclusion made in section 5, that communication may be counterproductive when identity is unknown. Further, the last three columns show that communication reduces the probability of using a High-bid strategy when identities are known.

Table 9. Impact of communication on bidding strategy

Sample:	ND-NC & ND-C			D-NC & D-C		
Dependent variable:	High	Moderate	Low	High	Moderate	Low
-C	1.129**	-0.101	-1.753*	-0.725	0.477	1.554*
	(0.473)	(0.324)	(0.386)	(0.441)	(0.372)	(0.336)
Age	-0.039	0.086	-0.053	-0.065	-0.053	0.058
	(0.142)	(0.075)	(0.077)	(0.107)	(0.114)	(0.083)
Female	1.064**	0.313	-0.639*	0.502	0.441	-0.676**
	(0.491)	(0.326)	(0.377)	(0.438)	(0.372)	(0.336)
Constant	-2.087	-1.959	-0.627	-1.117	-0.408	-1.394
	(2.590)	(1.494)	(1.540)	(2.171)	(1.298)	(1.714)
N (observations & subjects)	158	158	158	158	158	158
Pseudo R2	0.083	0.011	0.044	0.027	0.022	0.029

Note: Logit regressions with robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The individual level analyses strongly suggest the following: (i) When identity is unknown, communication may increase the share of people who engage in conflict. (ii) Releasing demographic information in the absence of communication can reduce the number people who are likely to engage in conflict, but the effect of releasing demographic communication may be opposite when communication is possible.

7. Discussion

We investigate experimentally whether immigration identity affects conflict behavior. Moreover, we test the effect of restricted communication on conflict with and without the presence of the immigration identity. In contrast to the conventional wisdom, we find that overall, the salience of the immigration identity does not increase the conflict level on the aggregate level. Moreover, unlike free-flow communication as in the literature, we find that restricted communication does not help reducing the conflict level, with or without the presence of information about identity. Exploring the data further, we find that the identity may have an initial positive effect on the level of conflict, but that effect dies out faster over time compared to the no identity treatments. Such reduction in conflict is less prominent when communication is allowed, reflecting a possible obfuscation effect of restrictive communication. Finally, we find that although the types of communication received does not affect conflict behavior, the type of communication sent are often correlated with own behavior of subjects with respect to their bids. Subjects also readjust how they communicate to their opponent in later compared to earlier conflict rounds. All of these are new results and has implications for conflict resolution.

We rationalize the no-effect of identity on conflict level in terms of differences in inborn identity and acquired identity. Whereas an acquired identity such as immigration status has

some initial effects on conflict, over time it dies out, even though this may not be the case for the inborn identities such as race or religion. The results also show that a strictly restrictive communication will not have the same effect as a free-flow communication and may fail to yield the success of conflict resolution as shown by the existing studies. Moreover, it seems that such restrictive communication could impede the reduction of conflict level if identity is not revealed.

It is possible, of course, that there are other explanations for these results. In Britain, for example, it has been observed that animosity towards immigrants among white majority natives can be mitigated if the immigrants are also communicated to be whites (Kaufman, 2019). In our experiment no information about the racial identity of the different group compositions were given. Hence, it may be possible that the level of conflict was not high for immigration status. This argument, however, is in the line that the acquired identity of immigration status is not as strong as the inborn identity of race to inflict a higher level of conflict.

Since our experiment contributes to the intersection of communication and identity, it is important to draw parallels to other relevant games in the literature. It is often observed in other aspects of human behavior, such as in the case of social dilemma, that cooperation increases drastically due to communication. Bicchieri (2002) posits two different reasons for this outcome: enhancement of group identity due to communication, and elicitation of social norms due to communication. The author argues that in social dilemma situations, the norm-based explanation is more credible. For our experiment, none of these explanations are credible. To begin with, our restricted communication does not allow unification of the two identities in terms of immigration status. Further, communication permitted in our treatments does not allow subjects to elicit any social norm. It is possible that therefore communication in our experiment does not lower conflict. However, this also supports our point that the type of restrictions on communication matters in conflict resolution.

Our results warrant further research in this area. In the dimension of identity, our study warrants further investigations in the definition and understanding of the concept of identity in conflict. While it is established in the literature that the salience of some social identities can instigate and increase conflict, it is yet not established what those identities might be. It may be useful to interact with the empirical literature (see Chowdhury, 2021 for a survey) to design the structures for experimental investigations.

It would also be important to find the optimal level of communication in experimental conflict games that does not allow collusion but, at the same time, helps conflict resolution outcomes. While communication is used as a treatment liberally in various experimental games, there role that the nature of communication plays in reducing conflict requires further investigation. Given our finding that communication may slow down the reduction rate of conflict over time under certain circumstances, it will also be interesting to investigate when communication may increase conflict. We leave all these for future research.

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Appendix A: Additional Tables and Figures

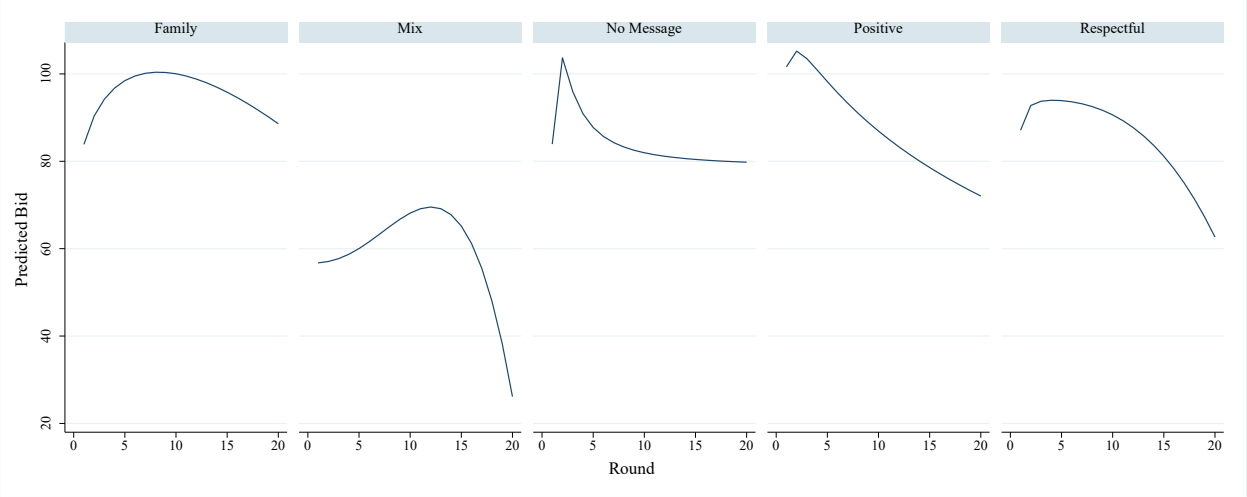
Results on Table 6 for women only

Dependent variable: Bid amount	(1) ND-NC& D-NC	(2) ND-NC & D-NC	(3) ND-NC & D-NC	(4) ND-NC & D-NC	(5) ND-NC & D-NC	(6) ND-NC & D-NC
Own message *Social*	6.213**					
	(2.717)					
Own message *Constructive*		-3.721				
		(3.157)				
Own message *Fair*			.194			
			(2.6)			
Own message *Social*				1.093*		
				(.642)		
Own message *Constructive*					-.21	
					(.667)	
Own message *Fair*						-.229
						(.682)
Age	-.569	-.516	-.533	-2.301*	-2.226*	-2.279*
	(.51)	(.5)	(.504)	(1.264)	(1.246)	(1.271)
Round	-.501***	-.509***	-.512***			
	(.124)	(.125)	(.124)			
L.own bid	.602***	.607***	.608***			
	(.044)	(.045)	(.044)			
L.other bid_	.103***	.104***	.104***			
	(.019)	(.019)	(.019)			
L.win	-.435	-.134	-.324			
	(1.905)	(1.928)	(1.894)			
Constant	41.768***	42.697***	42.166***	129.139***	134.943***	136.163***
	(11.564)	(11.506)	(11.404)	(25.725)	(26.554)	(27.185)
N (observations)	1767	1767	1767	93	93	93
N (subjects)	93	93	93	93	93	93

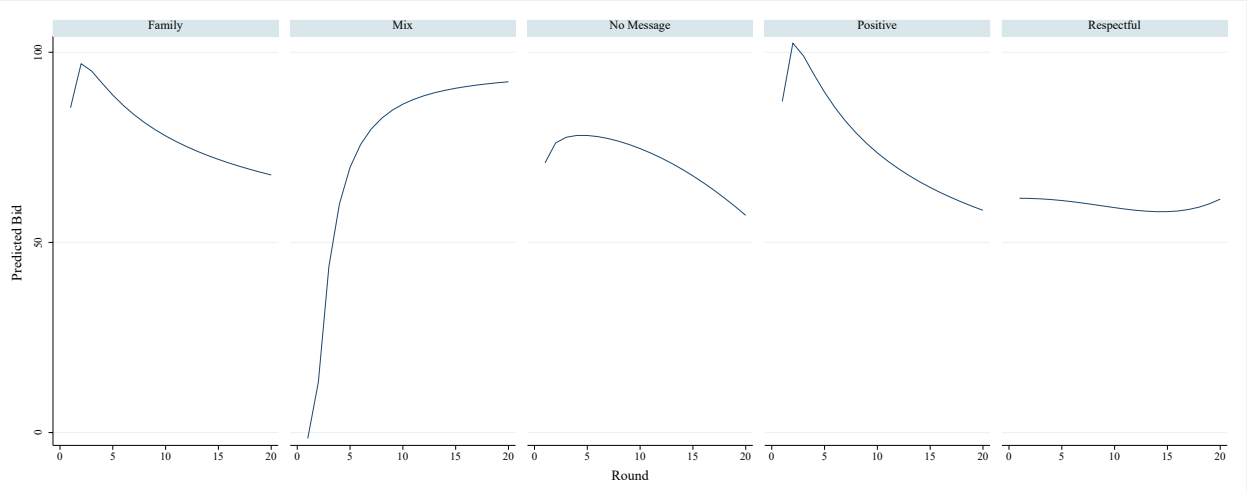
Results on Table 6 for men only

Dependent variable: Bid amount	(1) ND-NC& D-NC	(2) ND-NC & D-NC	(3) ND-NC & D-NC	(4) ND-NC & D-NC	(5) ND-NC & D-NC	(6) ND-NC & D-NC
Own message *Social*	4.784					
	(2.986)					
Own message *Constructive*		-.074				
		(2.659)				
Own message *Fair*			-5.842*			
			(3.369)			
Own message *Social*				1.054		
				(.764)		
Own message *Constructive*					.422	
					(.838)	
Own message *Fair*						-1.012
						(.839)
Age	.776	.659	.763	3.384	2.76	3.276
	(.718)	(.722)	(.721)	(2.216)	(2.308)	(2.238)
Round	-.325**	-.321**	-.331**			
	(.152)	(.153)	(.153)			
L.own bid	.713***	.718***	.713***			
	(.057)	(.058)	(.058)			
L.other bid_	.077***	.077***	.078***			
	(.024)	(.023)	(.024)			
L.win	-2.939	-2.889	-3.015			
	(2.192)	(2.205)	(2.226)			
Constant	1.74	5.279	5.188	-3.56	14.704	11.258
	(15.075)	(14.759)	(14.601)	(46.348)	(45.123)	(43.667)
N (observations)	1235	1235	1235	65	65	65
N (subjects)	65	65	65	65	65	65

Results on Figure 3 Average bids by most frequent message sent: women only



Results on Figure 3 Average bids by most frequent message sent: men only



Appendix B. Experimental Instructions

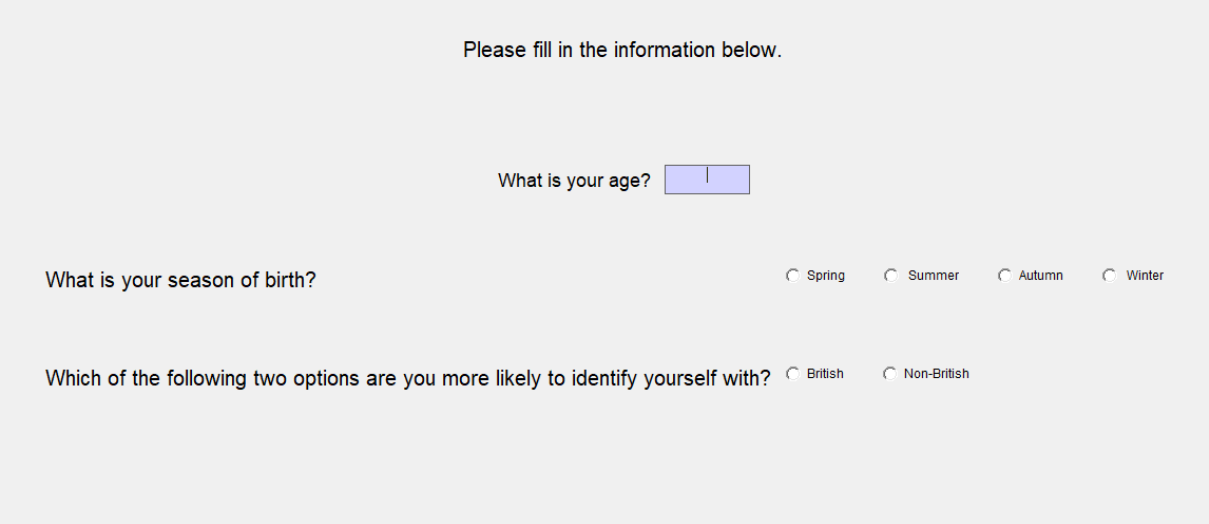
Instructions [D-C treatment]

Welcome to this experiment. This is an experiment about decision-making. You will have a chance to earn money, depending on your choices and the choices of others. Earnings will be paid out to you in private and in cash at the end of the experiment.

There are other people in this room, who are also participating in this experiment. Everyone is participating for the first time, and all participants are reading the same instructions. During the experiment, we request that you **turn off your mobile phone, remain quiet and do not attempt to communicate with other participants.** Participants not following this request may be asked to leave without receiving payment. If you have any questions, please raise your hand and the experimenter will come to you.

This experiment consists of **20 rounds**. In the beginning of each round you will be randomly matched with another participant in this room. Depending on the outcome of the random matching in each round, you may be matched with a different participant in each round.

At the beginning of the experiment you will be asked to give some information about yourself. In particular, you will be asked to indicate your age, season of birth and whether you identify as British or non-British. You will be asked to indicate this information on a screen like the one below.



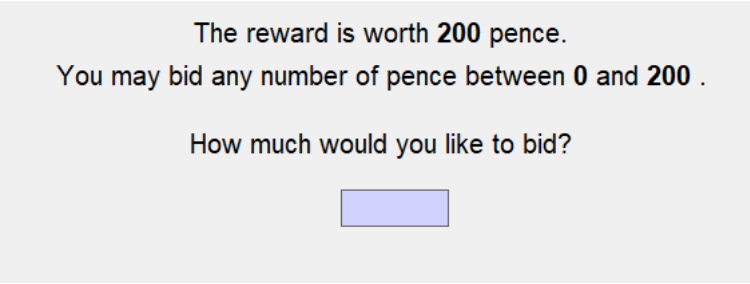
In the beginning of each round you will have the option to **describe yourself to the person you are matched with**. You will be able to choose between three different descriptions. You

may also choose not to describe yourself to the person you are matched with by choosing the option "[blank]". You and your matched participant will thereafter learn about one another's self-description as well as age, season of birth and whether you identify as British or non-British. If a participant has chosen not to describe themselves to the other participant, no self-description will be shown to the other participant. Since you will choose how to describe yourself in each of the 20 rounds, the way you describe yourself in a given round will be shown to your matched participant in that specific round only.

Bidding for a reward

In each round, after learning about your matched participant, you will be asked to make a decision. Your decision may affect your earnings and the earnings of the participant you are matched with. Similarly, in each round, the decision of the participant you are matched with may affect their earnings and your earnings.

In each round, you will receive an initial **endowment of 200 pence** (£2). In each round, there is also a **reward of 200 pence**, which will be assigned either to you or to the participant you are matched with. **In the beginning of the round you may bid for this reward**. You bid with your endowment such that the number of pence you bid is subtracted from your endowment. You may therefore bid any number of pence between 0 and 200. An example of your decision screen is shown below.



Your chance of receiving the reward is given by your bid divided by the sum of the bids of both you and your matched partner. Therefore:

$$Your\ chance\ of\ receiving\ the\ reward = \frac{Own\ bid}{Own\ bid + Matched\ participant's\ bid} * 100\%$$

This means that if you and your matched participant make an equally large bid, then you will both have a 50% probability of receiving the reward. If you bid twice as much as your matched

participant, your probability of receiving the reward will be twice as large as the probability for your matched participant. In other words, the more you bid relative to the other participant, the more likely you are to receive the reward.

Calculation of earnings

If you receive the reward, your earnings for that round are equal to your endowment minus your bid plus the reward. If you do not receive the reward, your earnings for that round are equal to your endowment minus your bid. Therefore, your earnings will be calculated as follows:

If you receive the reward:

$$Earnings = Endowment - Your\ bid + Reward$$
$$= 200 - Your\ bid + 200$$

If you do not receive the reward:

$$Earnings = Endowment - Your\ bid$$
$$= 200 - Your\ bid$$

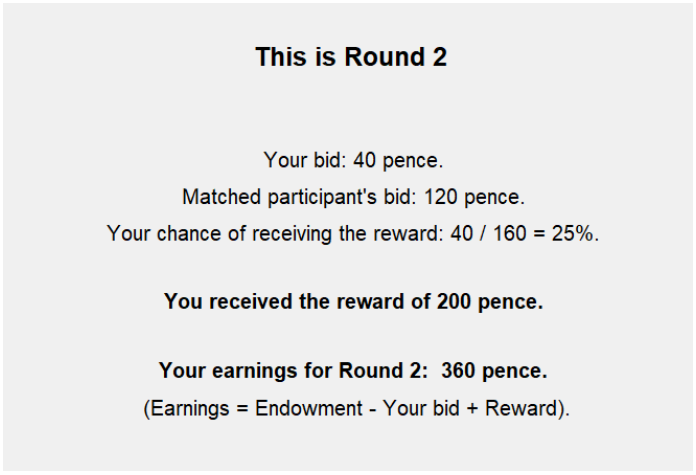
An example of how earnings will be determined in each round

For ease of understanding, let's think of the **amount that both participants have bid** as the **number of lottery tickets that they have bought** and that one of these lottery tickets will be drawn at random to determine who will win the reward.

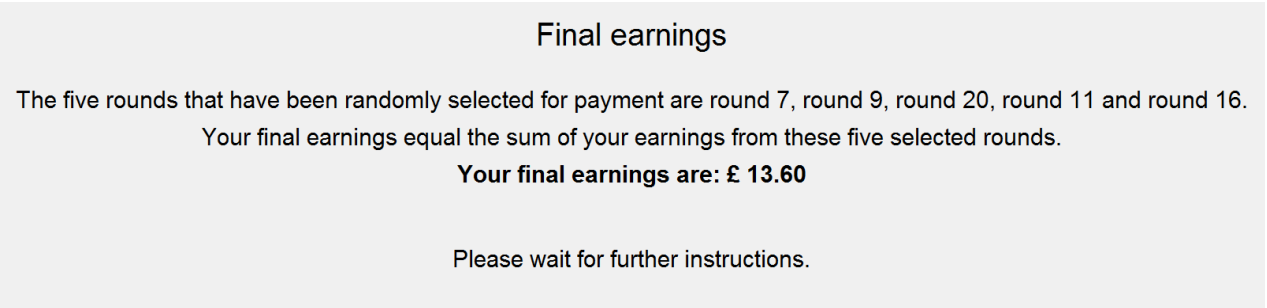
Let's say Participant 1 bids 40 pence and therefore has 40 lottery tickets and Participant 2 bids 120 pence and therefore has 120 lottery tickets. Therefore, the sum of bids is 160, meaning that there are 160 lottery tickets in total. Then one of the total 160 tickets is drawn at random and the reward is assigned to the holder of the ticket. Participant 1 has a 25% chance of receiving the reward since he holds 25% of all tickets ($\frac{40}{160} * 100\% = 25\%$). Participant 2 has a 75% chance of receiving the reward, since he holds 75% of all tickets ($\frac{120}{160} * 100\% = 75\%$).

Suppose that the computer draws a lottery ticket held by Participant 1. Therefore, in that round, Participant 1 receives the reward and earns 360 pence ($200(endowment) - 40(own\ bid) + 200(reward) = 360$). Participant 2 then earns 80 pence ($200(endowment) - 120(own\ bid) = 80$).

At the end of each round, you will be shown a summary including your bid, the bid of your matched participant and whether you received the reward. An example of a summary is shown below.



At the end of the experiment the computer will randomly select 5 of the 20 rounds to be used for calculation of your final earnings. You will be **paid the sum of your earnings in these 5 randomly selected rounds**. This information will be shown to you using a computer screen similar to that shown below.



Thereafter, the experiment will end and all participants will be paid their earnings in private and in cash.

Please raise your hand if you have any questions.

Before we begin the experiment we want to check that each participant understands how their earnings will be calculated. To do this we ask you to answer the questions below. In a couple of minutes, the experimenter will check your answers. When each participant has answered all questions correctly we will continue with the experiment.

If you have a question at any time, raise your hand and the experimenter will come to your desk to answer it.

Questions

1) How many rounds are there?

a) 5
b) 2
c) 20

2) How many times will you be randomly matched with another participant

a) 20 (one for each round)
b) Only once (in the beginning of the first round)
c) It depends on the random matching

3) To how many will the reward of 200 pence be assigned in each round?

a) This depends on the selection of the computer
b) To either myself or the participant I am matched with
c) Either no-one or to both myself and the participant I am matched with

4) Suppose Participant 1 is matched with Participant 2 in Round 6. Participant 1 bids 5 and Participant 2 bids 45. What is the chance that Participant 1 receives the reward?

a) 5%
b) 10%
c) 50%